



California Commissioning Collaborative



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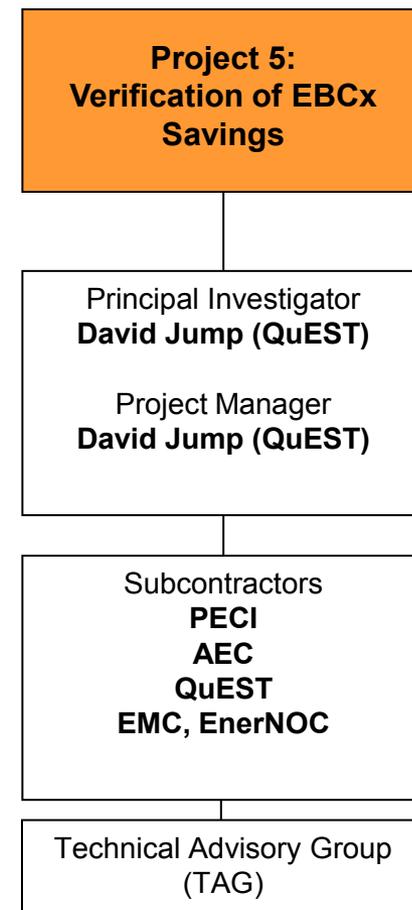
Verification of Existing Building Commissioning Project Savings

*Presentation to the
California Commissioning Collaborative
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Project Team

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Agenda

- Project Summary
 - Recent Developments
- Feedback on Outreach Plans

Verification of Savings Project

- Develop additional VoS guidelines for existing building commissioning projects
- Pilot demonstrations and case studies
- Refine existing Option B/C guideline
- Develop criteria and guidance on selecting appropriate methods
- Conduct outreach

2008 CCC VoS Guideline

- Based on interval data method:
 - Hourly or daily regressions
 - Applied to whole building or subsystems
 - IPMVP adherence if strictly applied
 - Option B (retrofit isolation)
 - Option C (whole building)
- Downside:
 - Cannot verify individual ECMs, when many ECMs within system or building, only total savings within

Current VoS Project

- Additional methods developed:
 - Engineering calculations & field verification
 - Equipment or system energy measurement
 - Energy models using interval data
 - Calibrated simulation

Method 1

- Engineering Calculations & Field Verification
 - Verifies individual ECM savings
 - Applies to equipment or systems
 - Mirrors industry practice
 - Recommends best practices
 - Describes use of post-installation operational verification in “truing up” savings estimates
 - Not IPMVP adherent

Method 2

- Equipment or System Energy Measurement
 - Verifies individual ECM savings
 - Applies to equipment or systems
 - Methodology framework based on
 - Baseline load and schedule characteristics
 - constant or variable
 - Impact of ECM
 - Post-install load and schedule characteristics
 - IPMVP adherent

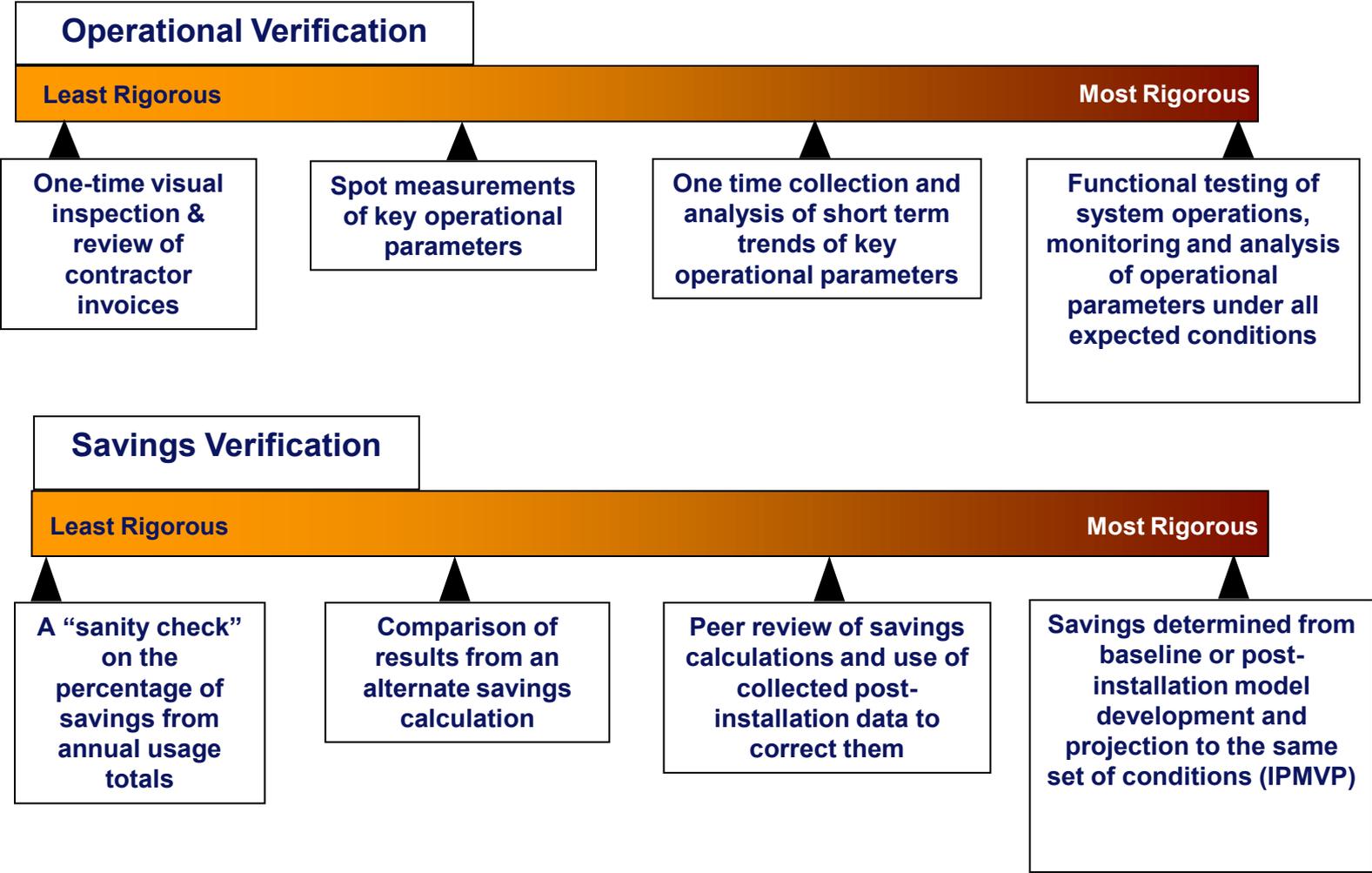
Method 3

- Energy Models using Interval data
 - Verifies system or whole building total savings
 - Regression-based methodology
 - ASHRAE RP1050 change-point models
 - Hourly or daily time intervals
 - Improved based on feedback from pilots, previous guideline comments
 - IPMVP adherent

Method 4

- Calibrated Simulation
 - Whole building or systems, depending on software
 - Can identify individual ECM savings
 - Useful when simulation used for ex-ante savings
 - Can be most difficult and expensive method
 - IPMVP adherent

Essential Components of M&V



Integrating Savings Verification in EBCx

- EBCx Project Phases
 - Planning
 - Investigation (ex-ante savings estimates)
 - Implementation
 - Hand-off
 - Ongoing Commissioning
- Operational Verification is already a part of EBCx
 - in Hand-Off Phase

Integrating Savings Verification into EBCx

- Each method describes what activities are required in different phases of an EBCx project
- EBCx is a quality assurance process
 - Savings Verification is one more attribute

Pilot Project Summary

- Understand how Interval Data Method can be used in EBCx industry
 - Advantages/Disadvantages
- Engage two EBCx providers to:
 - Implement method on an existing project
 - Obtain feedback to improve Guideline
 - Understand technical issues involved
- Develop Case Studies
 - demonstrate use & results
 - highlight key issues

Method Selection Criteria & Guidance

- Methods vary:
 - Meet different verification goals
 - ECM vs. whole building savings
 - Yield savings uncertainty estimates
 - Check savings persistence
 - Require different resources and impose constraints
 - Have different data and analysis requirements
 - Shorter or longer monitoring requirements
 - Tool availability
 - Expertise

Summary

- Guideline in “book” format with chapters:
 1. Introduction
 2. Integrating Savings Verification into EBCx projects
 3. Method Selection
 4. Method 1: Engineering Calculations with Field Verification
 5. Method 2: Equipment or System Energy Measurements
 6. Method 3: Energy Models Using Interval Data
 7. Method 4: Calibrated Simulation
 8. Appendices
- Near-final drafts of chapters & appendix to Technical Editor

Connections to external research/activities

- Other CCC/CEC projects:
 - EBCx Tools Development
 - EBCx Persistence Improvement
- Other Tools
 - ECAM and Universal Translator for data preparation
 - Private sector tools (QuEMS, Energy Explorer, etc.)
 - LBNL/CEC UT-M&V Tool Module (future)
- Program evaluation requirements/directives from CPUC
 - IPMVP methods
- ASHRAE Research Project 1404
 - Minimum data requirements for energy models

Outreach Goals

- EE-EBCx programs reference guideline
 - For a specific method
 - For any method
 - Add savings verification as a process requirement
- EBCx providers apply methods in projects
- Improve industry understanding of M&V
 - Appropriate data
 - Baseline requirements
 - Methods and algorithms
- EE and Cx industry endorse guideline

Outreach Plan

- Overall Goal
 - Owners & Program Managers have high confidence in EBCx savings & lifetimes
 - Raise realization rates for EBCx programs
 - Programs and evaluators work from same verification standards

Outreach Activities - High Priority

- Post guideline & case studies on CCC website
 - Track downloads
- Conduct utility program-focused workshops
 - ½ to 1 day for program managers
 - Northern CA (SMUD, PG&E)
 - Southern CA (SCE, SoCalGas, SDG&E, LADWP)
 - High-level discussion, not rigorously technical
 - What is needed for program endorsement?
 - What follow-up?

Outreach Activities – High Priority

- Training for service providers
 - Series of web-based meetings
 - On integrating M&V in EBCx & selecting a method
 - On the methods (1 or many webinars)

- Other ideas?

Outreach Activities – Next Priorities

- Present guide to industry groups
 - Obtain endorsement and promotion
 - Efficiency Valuation Organization (IPMVP)
 - NR Canada has agreement for EVO to review & endorse if OK
 - ASHRAE
 - Others?
- Conference presentations
 - e.g. ASHRAE, NCBC, AEE EMC, etc.

- Questions? Comments?

Thank you for your participation!